# FACT SHEET FOR AQUATIC WEED CONTROL IN IRRIGATION SYSTEMS GENERAL NPDES PERMIT

## SUMMARY

The State of Washington Department of Ecology (Department) has tentatively determined to issue a general permit for the application of herbicides to control aquatic weeds in irrigation water conveyance systems that transport surface waters of the State of Washington. The use of herbicides is subject to the provisions of integrated pest management plans (IPMs). Monitoring is required in certain situations. Any short term toxicity to aquatic organisms is allowed under the terms of the permit and the water quality modification provisions to perform essential activities that promote effective water delivery. The proposed terms, limitations and conditions contained herein are tentative and may be subject to change, subsequent to public comments and testimony provided at public hearings. All facilities accepted under the general permit will not be relieved of any responsibility or liability at any time during the life of the permit for: (1)violating or exceeding State water quality standards; or (2) violating any other local, State, or Federal regulation or standard as may pertain to the individual facility. Activities not accepted under the general permit may be required to apply for an individual permit. Any application of herbicide to surface waters of the state requiring NPDES permit coverage found not covered under either a general permit or an individual permit will be considered to be operating without a discharge permit and subject to potential enforcement action.

On March 12, 2001, the Ninth Circuit Court of Appeals decided that application of a herbicide in compliance with the labeling requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) did not exempt an irrigation district from needing to obtain a NPDES permit. (Headwaters, Inc. v. Talent Irrigation District). Ecology, as had many more states, had been issuing orders that were not NPDES permits that placed protective conditions on the use of herbicides in waters of the state. This general permit will replace those short term modifications where herbicide applications are directed into irrigation water conveyance systems for the purpose of controlling weeds.

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## INTRODUCTION

This fact sheet is a companion document that provides the basis for issuance of the Irrigation System Aquatic Weed Control National Pollutant Discharge Elimination System (NPDES) General Permit. The Department of Ecology (the Department) is proposing to issue this permit, which will allow discharge of wastes from aquatic herbicide applications and from nonchemical methods to control aquatic weeds in surface waters of the State of Washington, which are also waters of the United States, pursuant to the provisions of chapters 90.48, 90.52, and 90.54 Revised Code of Washington (RCW) and the Federal Water Pollution Control Act (FWPCA) as amended. This fact sheet explains the nature of the proposed discharges, the Department's decisions on limiting the pollutants in the wastewater, and the regulatory and technical basis for these decisions.

The Federal Clean Water Act (FCWA, 1972, and later modifications (1977, 1981, and 1987), established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has delegated responsibility to administer the NPDES permit program to the State of Washington on the basis of Chapter 90.48 RCW which defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The establishment of a general permit for irrigation system aquatic weed control is appropriate due to the similar environmental fate specific to each permitted herbicide, the uniform discharge conditions to which all applications would be subject, the statewide scope of irrigation system aquatic weed control, and the significant reduction of resources necessary for permit handling. However, individual permits will still be considered in those instances where a proposed activity requires more detailed guidance, or when an individual applicator so desires and the Department approves.

The regulations adopted by the State include procedures for issuing general permits (Chapter 173-226 WAC), water quality criteria for surface waters (Chapters 173-201A WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastes to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-226-110) for issuing a general permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the draft permit, public hearings, comment periods, and public notice of issuance are all required before the general permit is issued (WAC 173-226-130). The fact sheet, application for coverage and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

The fact sheet and draft permit have been reviewed by representatives of the potential permittees and other members of a permit advisory group. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The original fact sheet will not be revised after the public notice is published. Comments and the resultant changes to the permit will be summarized in Appendix D--Response to Comments.

## BACKGROUND INFORMATION

In May, 1996, the Talent Irrigation District (TID) in southern Oregon applied the herbicide acrolein to an irrigation canal. A leaking waste gate resulted in the discharge of treated water into Bear Creek where a fish kill occurred.

Headwaters, Inc. and Oregon Natural Resources Council filed a Clean Water Act citizen suit against the Talent Irrigation District (TID) for applying aquatic herbicide into a system of irrigation canals. Reversing a district court's opinion, the Ninth Circuit in a March 12, 2001 decision held that application of the herbicide in compliance with the labeling requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) did not exempt TID from having to obtain a National Pollutant Discharge Elimination System (NPDES) permit, and that the irrigation ditches were "waters of the United States" under the Clean Water Act.

The Federal Insecticide, Fungicide, and Rodenticide Act of 1979 (FIFRA), as administered by the United States Environmental Protection Agency (EPA), requires that all persons who apply pesticides classified as restricted use be certified according to the provisions of the act or that they work under the supervision of a certified applicator. Commercial and public applicators must demonstrate a practical knowledge of the principles and practices of pest control and safe use of pesticides, which will be accomplished by means of a "core" examination. In addition, applicators using or supervising the use of any restricted use pesticides purposefully applied to standing or running water (excluding applicators engaged in public health related activities) are required to pass an additional exam to demonstrate competency as described in the code of federal regulations as follows:

> "Aquatic applicators shall demonstrate practical knowledge of the secondary effects which can be caused by improper application rates, incorrect formulations, and faulty application of restricted pesticides used in this category. They shall demonstrate practical knowledge of various water use situations and the potential of downstream effects. Further, they must have practical knowledge concerning potential pesticide effects on plants, fish, birds, beneficial insects and other organisms which may be present in aquatic environments. Applicants in this category must demonstrate practical knowledge of the principles of limited area application." (40 CFR 171.4)

Aquatic weeds, such as rooted aquatic macrophytes, reduce storage capacity in reservoirs, block screens and intakes on pumps, interfere with hydroelectric production, distort canal design features (increase sedimentation, decrease channel flow, etc.), degrade recreational uses, and reduce water quality and wildlife habitat value. In general, designed capacity of irrigation canals in the West has not accounted for flow resistance caused by aquatic vegetation (Pitlo and Dawson 1993) although recent work provides the empirical basis for such design considerations (Kouwen 1992, Abdelsalam et al. 1992)

Lack of a comprehensive botanical survey and the use of common names, which can vary from district to district, limits description of the problem species in irrigation canals. From the limited botanical surveys conducted, two plants are likely to account for most of the aquatic plant problems in irrigation districts in the northwest, Sago pondweed (Potamogeton pectinatus) and Canadian pondweed (Elodea canadensis). Other non-native species, such as Brazilian elodea (Egeria densa), Eurasian watermilfoil (Myriophyllum spicatum), and Curly-leaf pondweed (Potamogeton crispus) also create flow blockage in irrigation systems in the state. Bartley et al. (1974) reported that Potamogeton species are the most common nuisance plants in western irrigation canals.

**AQUATIC WEED MANAGEMENT**

There are approximately 97 irrigation districts and irrigation water companies comprising of over one million acres represented by the Washington State Water Resource Association. The irrigation districts are created and regulated under Chapter 87 RCW - Irrigation District Laws and Chapter 90 - Water Laws. Irrigation water supply companies are private non-profit water suppliers. The Ellensburg Water Company, created in 1885 before irrigation law was established is an example of a private non-profit water supplier. Each irrigation district employs its own Washington State licensed applicator(s). Each licensed applicator must have an aquatic pesticides endorsement. A licensed applicator can supervise unlicensed applicators as long as they are within calling and sight distance. Numbers of applicators (licensed and unlicensed) vary according to the size of the irrigation district.

Applications can start shortly after the irrigation season begins which typically starts around the middle of March with initial charging of the system and ends before the end of the irrigation season which usually ends in October or early November. Depending on the size of the system, needs for delivery and environmental factors, applications can occur as often as every two weeks but usually occur once a month. Some of the smaller systems may only require one or two treatments per season.

Irrigation districts monitor the levels of plant and algae growth to determine the exact days for treatments. Depending on the size of the system, treatments may start at any time of the day. Plant and algae growth criteria (length of plants and algae) trigger when applications will be done. The trigger levels are correlated to the ability of the irrigation system to carry the desired amount of water. If trigger levels are exceeded, then flows are hindered and overflows may occur resulting in washouts of the overloaded canals. Monitoring of the types of plants present determines the types of herbicides to be used.

Depending on the quality of the water, early in the season when light levels are lower and air and water temperatures are lower, moss and green algae growths may need treatments. As light levels and air and water temperatures increase (late May – early June), blue-green algae and aquatic plant growth rates can dramatically increase (treated with copper, acrolein or xylene.

## AQUATIC WEED MANAGEMENT METHODS

There are several methods to control weeds in irrigation systems. Three herbicides are the subjects of this general permit, acrolein, xylene and copper. Other herbicides are not as effective or have unwanted effects outside the irrigation supply system. Other nonherbicidal methods are available and also discussed in this fact sheet. The other methods include physical removal of weeds such as hand pulling, chaining, backhoe, mechanical harvesting, manipulation of water levels, sediment removal, canal lining, shading, piping, and herbivorous fish. An engineering report is underway which will provide an evaluation of alternative methods of control of aquatic weeds in irrigation supply systems.

### Acrolein

Acrolein (acrylaldehyde, 2-propenal) is an aliphatic, $\alpha,\beta$-unsaturated aldehyde that occurs naturally as a product of combustion and as a metabolite. Acrolein is a pungent, colorless, highly volatile liquid used as a mulluscicide and herbicide, as a fixative in histochemical investigations, and as an intermediate in the production of numerous chemicals and reagents, including acrylic acid and DL-methionine (an essential amino acid used to supplement poultry and cattle feed) (Ghilarducci and Tjeerdema 1995). In 1983, approximately 98 percent of all production went to the manufacture of acrylic acid and DL-methionine (Ghilarducci and Tjeerdema 1995). Approximately 54,000 tons were produced industrially in the United States in 1992 (Anonymous 1992, as cited in Ghilarducci and Tjeerdema 1995). The main source of acrolein and the principal mode of human exposure, however, is through incomplete combustion in residential fireplaces, manufacturing, photochemical oxidation of airborne hydrocarbons, and cigarette smoke. The compound is also produced naturally in metabolic processes in soils (formation of humic substances) and in food (dehydration of glycerol) (Ghilarducci and Tjeerdema 1995). In a study of human exposure to acrolein, the greatest measured concentrations in typical ambient air occurred in heating animal and vegetable cooking oils (57.6 - 103.6 $mg/m^3$), near automobile exhaust (0.13 to 50.6 $mg/m^3$), and in a coffee roasting outlet (0.59 $mg/m^3$) (references in Table 4 of Ghilarducci and Tjeerdema 1995).

Acrolein is a cell toxicant of high reactivity. The compound is capable of spontaneous polymerization, which must be inhibited by hydroquinone. The chemical characteristics of acrolein, in particular the induced polarity caused by electronegative carbonyl oxygen atom, allows the molecule to react with nucleophilic reagents that contain sulfhydryl groups, such as free cysteine or cysteine-containing proteins. Thus, the compound can react with proteins and nucleic acids and induce cross-linkages and macromolecular rearrangements that result in tissue damage (Ghilarducci and Tjeerdema 1995).

Acrolein is highly toxic. The reported 60-day no-observable-effect-level is as low as 11.4 μg/L (WHO 1992, as cited in Ghilarducci and Tjeerdema 1995). Westerdahl and Getsinger (1988) reported that fish are killed when exposed to concentrations greater than 1 mg/L. Concentration-dependent histopathological effects on coho salmon gills, kidneys, and liver were found with exposures ranging up to 100 μg/L, and 100 percent lethality at 75 μg/L within 144 hours (Lorz et al. 1979). To protect freshwater animals from adverse effects, USEPA recommends a water quality limit of 1.2 μg/L for a 24-hr. average and a maximum of 2.7 μg/L; to protect human health from ingestion of treated water and organisms, the maximum concentration is 6.5 μg/L (Sittig 1980). Registered use concentrations are 1-15 mg/L (Dave Blodget, Baker Petrolite, personal communication, 4 Dec. 1997). Acrolein is not carcinogenic and shows little embryotoxic and teratogenic behavior (Ghilarducci and Tjeerdema 1995)

Plants treated with acrolein become flaccid and disintegrate within a few hours of even a short exposure. Phytotoxicity is temperature dependent (Ashton and Crafts 1973). Bartley and Gangstad (1974) reported that for aquatic plant control, acrolein is applied full strength (95%) directly to the water using metering equipment calibrated to produce a rate not greater than 15 mg/L. In larger canals, applications are often made at 0.1 mg/L over a 48-hour period. Current labels do not allow for applications over 8 hours. In smaller canals the same quantity of materials is applied over a shorter period. The amount of material used is directly related to the volume of water treated. Smaller canals use smaller volumes of chemicals. The amount used is also related to the level of weed growth. The length of time for the treatment, and hence the concentration, varies from 15 minutes to 8 hours and depends on the system conditions such as water velocity.

Monitoring of acrolein concentrations in the irrigation systems of the Columbia Basin during the 2001 season indicate that when the treated slug of water is controlled, acrolein can be kept out of the natural waters. Detection levels were in the 1 ug/l range.

Acrolein is relatively nonpersistent. The half-life in aquatic systems ranges from less than one to approximately four days (Callahan et al. 1979, Bowmer and Higgins 1976, WSSA 1994). The acrolein distributor, Baker Petrolite, conducted extensive field studies, including those done in support of registration. Those studies indicate a half-life in irrigation systems of 6 to 10 hours. Volatilization is of major importance in loss from aquatic systems (Ghilarducci and Tjeerdema 1995), however, it is not the only mechanism. Another fate process is hydration. Upon hydration, β-hydroxypropionaldehyde is produced and is easily biotransformed (Reinert and Rodgers 1987). Half-life in water is not a function of the aerobic or anaerobic condition. Photolysis, hydrolysis, oxidation, and sorption are not considered significant fate processes (Callahan et al. 1979, Mabey 1981).

In irrigation systems, acrolein is applied subsurface at the upstream end of the portion of the canal being treated. The herbicidal activity is a function of the length of the treated water plug, the concentration of chemical, temperature, and flow rate. Because of its high toxicity, and short contact time, acrolein is highly efficacious in irrigation systems (Bowmer and Smith

1984). The compound is a contact herbicide, however, and repeated applications through the growing season are often required to maintain flow.

**Xylene**

Xylene (1,2-, 1,3-, and 1,4-dimethyl benzene) is an aromatic solvent registered for aquatic weed control for use in programs of the Bureau of Reclamation, Department of the Interior, and cooperating water user organizations.

Xylene is insoluble in water and must be applied with an emulsifier. In 1967, over 750,000 gallons of xylene was used in Oregon, Washington, and Idaho for aquatic weed control in irrigation districts (Frank and Demint 1967) at rates up to 740 mg/L (Anderson 1993). More current xylene-use data could not be located. Xylene is an effective contact herbicide at concentrations as low as 200 mg/L (Otto 1970).

Xylene is highly toxic to aquatic organisms. The 96-hr $LC_{50}$ for rainbow trout was estimated to be 12 mg/L, with 100 percent mortality at 16.1 mg/L, and "anesthetic-like" effects after 2-hour exposure to 3.6 mg/L. Chronic (56 days) exposure to concentrations as low as 0.36 mg/L caused significant off-flavor in rainbow trout fillets. The no-effect level was established at 7.1 mg/L for a two-hour exposure. At treatment concentration, the emulsifier, Emcol AD-410, is much less toxic to rainbow trout than xylene (Walsh et al. 1975).

Xylene persistence in water is low. The predominant fate process is volatilization (Daniels et al 1975, cited in Reinert and Rodgers 1987). Other factors that contribute to loss of xylene from irrigation water include: breaking or disruption of the emulsion and absorption by plants (Frank and Demint 1970).

In humans and other mammals, xylene exposure at levels greater than those that occur during treatment can result in a variety of central and peripheral nervous system effects (Gandarias et al. 1995). There is no evidence that xylenes are mutagenic or carcinogenic (EHIS 1993).

Xylene is an effective herbicide in irrigation systems because of its phytotoxicity and minimal residual effects on crop plants. High toxicity to fish and other aquatic organisms, however, necessitates a high level of applicator competence and attention.

**Copper**

Copper was first used as an algaecide in the nineteenth century and is still widely used to control algae and higher aquatic plants (Murphy and Barrett 1993). Recently, chelated copper complexes have been produced that are effective in water with widely varying chemistry and less toxic to fish than copper salts, such as copper sulfate. Chelating compounds include ethylenediamine, alkanolamine, and triethanolamine. The ethylenediamine complex is most effective on rooted, aquatic plants (Anderson et al. 1987, 1993) and the alkanolamine and triethanolamine complexes are used as algaecides (WSSA 1994).

Copper is a required nutrient for plants and is important in a number of physiologically important compounds and processes, however, copper phytotoxicity occurs at high concentrations (Epstein 1972, Mengel and Kirkby 1987, Marschner 1986). Toxicity relates to the ability of copper to displace other metal ions, particularly iron, from physiologically important centers.

Since it is an elemental metal, copper is persistent in the environment. Copper ion is highly reactive, and tends to adsorb to clays and dissolved organic carbon in the water to form inorganic and organic complexes (WSSA 1994). The majority of copper applied to an aquatic system will eventually sorb to the sediments. The soluble copper ion is considered the toxic form and is bioavailable to most species (Reinert and Rodgers 1987). Complexed and adsorbed species are considered nontoxic (USEPA 1980, as cited in Reinert and Rodgers 1987), although fish-kills and loss of invertebrates in some lakes have been attributed to long-term copper application for algae control that led to extremely high sediment copper concentrations (Hanson and Stafan 1984).

Copper efficacy is a function of temperature and pH. Copper is more effective at high temperatures and under acid or neutral conditions. At high pH, copper reacts with dissolved carbonates and is precipitated as copper carbonate. Efficacy of chelated formulations is less susceptible to water chemistry and less toxic to fish (Murphy and Barrett 1993). In water with low alkalinity (50-100 mg/L $CaCO_3$) ethylenediamine-complexed copper controls most common aquatic weeds at 0.75 to 1 mg/L.

Low-rate, long-exposure copper treatments may be effective in control of some aquatic plants. In some irrigation canals copper is applied as a continuously metered supply at concentrations ranging from 0.005 to 0.02 mg/L for periods of days or weeks (Gangstad 1986, as cited in Murphy and Barrett 1993). Copper is sometimes used in irrigation canals to kill epiphytic algae prior to acrolein treatment. Such pretreatment increases the efficacy of acrolein for aquatic weed control.

**Hand-pulling**

Hand-pulling has been effective in control of some aquatic weeds in small canals and nearshore areas (Sculthorpe 1967, Shibayama 1988, Thamasara 1989), and less effective in others (Varshney and Singh 1976, as cited in Wade 1993). A number of tools have been developed to assist in hand-harvesting of aquatic weeds, including scythes, cutter bars, and mechanized hand-held cutters (Robson 1974, Cooke et al. 1993, McComas 1993). While hand-pulling is the most common method used for small scale aquatic plant management (Madsen 1997), the cost and difficulty of manual labor is often prohibitive and the efficacy limited when plant biomass is substantial and the infestation widespread (Wade 1993). Miles (1976, cited in Wade 1993) estimated the cost of manual control in a 20-m section of canal was more than three times the cost of using a tractor-mounted flail. A diver-operated dredge has proven effective, but expensive, in removing scattered plants in lakes (Madsen 1997).

Hand-pulling has some environmental impacts. Hand-pulling increased suspended sediment concentration by over 1600 percent and produced seven times as many plant fragments in the canal. Resuspended sediments can adversely impact water quality. In addition, high sediment loads in irrigation water can clog emitters used to increase efficiency of irrigation water use.

Several factors influence the cost and efficiency of hand-pulling for aquatic vegetation management. Physical factors such as channel width, depth, and current velocity affect the rate at which people can move around in the channel. Vegetation density influences the rate of vegetation removal, and worker fatigue can quickly reduce efficiency. For hand-pulling to be a viable option for vegetation management in canals it will likely be in small areas where other techniques cannot be employed. Canal flow should be reduced as much as possible to increase efficiency and safety of hand-pulling.

**Chaining**

Dragging a chain attached to tractors on either side of the canal was a common technique for aquatic plant removal prior to the use of herbicide alternatives (Wade 1993, Armellina et al. 1996). Chaining dislodges plant material that must be removed from the canal manually or by mechanical means. Plant material that is not collected may contribute to the dispersal of the plants and more extensive weed infestation.

As with many control techniques, timing of the treatment influences efficacy. Like other harvesting operations, rapid regrowth necessitates repeat treatment. Treatments that result in inhibition of propagule formation may have more long-term efficacy (Armellina et al. 1996), although all disturbance-based control methods probably have low efficacy against disturbance-tolerant species, such as many problem aquatic weeds (Sabbatini and Murphy 1996). Chaining for removal of canal vegetation also requires a roadbed on both sides of the canal, which may limit its applicability in many systems.

**Excavator/backhoe**

Plants may be physically removed from canals with a backhoe, dragline, or similar excavating equipment. Significant drawbacks in the use of an excavator for aquatic weed control in canals include damage to the canal profile and bottom seal and production of abundant plant fragments and turbidity.

Mechanical removal of aquatic vegetation with a backhoe was not highly effective in the Talent Irrigation District in 1997. Removal efficiency was highly variable because sediment suspension limited the operator's ability to see the plants in the canal. Suspended sediment concentrations increased by 150 times, and plant fragment generation increased by 100 times during backhoe operation. In addition, two weeks following treatment plant biomass was greater than before treatment, suggesting that mechanical removal would have to be repeated frequently.

**Mechanical harvesting**

Several types of mechanical harvesters have been developed for cutting and removing weeds from lakes and canals. These machines typically include a height-adjustable cutter bar and a basket or conveyor for collecting the cut plants. Floating machines that operate in lakes and reservoirs often have an integrated barge for transporting the cut plants to shore for off-loading. Machines that operate from the bank for use in canals are typically tractor-mounted, hydraulically controlled booms with cutter bars and baskets for collecting the cut plants. When risk of downstream dispersal of problem plants is low, choppers or cutters that leave the plant material in the canal may be more cost-effective than harvesters (Sabol 1987).

Mechanical harvesters must be able to remove approximately two tons of plant material for every mile of canal economically and effectively . In most cases, multiple harvests in a growing season will be required to control aquatic plants (Madsen et al. 1988, Thamasara 1989). Canals to be harvested must be accessible via maintenance road; and not blocked by trees, bridges, fences, and other obstructions. While plants may be piled on the maintenance road in some instances, plant disposal may be necessary near residences to avoid odor problems. Transportation of cut plants adds substantially to the costs of harvesting.

Mechanical harvesting impacts fish and wildlife when the animals are harvested along with the plants (Mikol 1985, Serafy and Harrell 1994), and may cause a shift in the aquatic plant community (Best 1994). Machines that chop plants without removing them from the water may also destroy wildlife living in the canal. Timing of the harvest operations to seasonality in plant physiology may enhance the efficacy of harvesting (Kimbel and Carpenter 1981, Perkins and Sytsma 1987) by reducing regrowth rates.

**Water level where irrigators have control**

Submersed aquatic plants are dependent upon water for physical support, and lack of a cuticle makes them particularly susceptible to desiccation. Drawdown and exposure has been used to effectively control some aquatic plant species. Drawdown is particularly effective in winter when sediments freeze. Some aquatic plants are adapted to fluctuating water levels (Sculthorpe 1967), and species vary in their response to drawdown (Cooke et al. 1993). Species with propagules that are resistant to desiccation, such as Sago pondweed, may survive exposure through water level drawdown. Seed germination in some species is enhanced by desiccation (Stanifer and Madsen 1997).

Timing of water level manipulation and understanding of the lifecycle of the problem species is critical to efficacy of water level manipulation for aquatic plant management. Early flooding of a California irrigation canal, for example, stimulated precocious germination of Variable-leaf pondweed (Potamogeton gramineus) winter buds. Subsequent drying of the canal prior to the irrigation season resulted in a reduction of P. gramineus and increase in spikerush biomass in the canal for several years (Spencer and Ksander 1996).

**Sediment removal**

Dredging to remove nutrient rich sediment can provide long-term control of aquatic plant growth. Excavation to depths below the light compensation point or to a substrate that does not support plant growth is critical to the success of dredging for aquatic plant control. Aquatic plants are tolerant of extremely low light intensities, and deepening to increase light limitation is probably not feasible in irrigation systems, however, if low-nutrient sediments or sediments that do not permit rooting and attachment of aquatic plants can be exposed through dredging permanent and effective plant control may be achieved (Cooke et al. 1993, Madsen 1997). Potential negative impacts of dredging for aquatic plant control in irrigation districts include: increased turbidity and suspended sediment in the water, which may impact efforts to conserve water through drip irrigation; damage to canal seal and increased loss through seepage; and changes in the gradient and flow characteristics of the canal.

**Canal lining**
Earthen canals provide a good substrate for aquatic plant growth. Lining the canals with geotextile material or concrete, poured in place or sprayed, would reduce availability of rooting substrate and reduce plant problems. Sediment deposition in the lined canal, however, may quickly negate benefits. Concrete-lined canals typically crack and require ongoing maintenance, and commonly have weed problems (Fred Nibling, USBOR, personal communication).

A new bituminous geotextile material for canal lining may provide a relatively inexpensive, long-term solution to aquatic weed growth in canals (L. Busch, USBOR, personal communication). In addition to reducing aquatic vegetation management costs, canal lining also reduces seepage losses from canals and is an important water conservation tool. Evaluation of this alternative is not yet complete.

**Shading**
Aquatic plants, like all plants, require light for photosynthesis. Submersed aquatic plants, however, are well adapted to the low-light conditions that result from light scatter and absorption by water and suspended materials in water. Decline of rooted aquatic plants in systems with high turbidity caused by suspended sediment (Johnstone and Robinson 1987; Engel and Nichols 1994) and phytoplankton (Phillips et al. 1978; Hough et al. 1991) has been attributed to light inhibition.

A number of techniques may be used to reduce light availability for aquatic plants, including dyes, shade fabrics, canal bank vegetation, and piping. Light absorbing dyes, such as Aquashade, are commonly used in closed (no outflow) systems, but is not registered for use in flowing systems. The shading effect of bank vegetation has been reported to impact aquatic plant growth (Dawson 1978, Dawson and Haslam 1983, and Pieterse and van Zon 1982, cited in Wade 1993).

Covering the canal with shading material stretched over a framework of metal or plastic may be less expensive initially than pipe for control of aquatic plant growth. An even less expensive alternative may be to train existing canal bank vegetation, e.g., blackberries, to grow over a metal framework to provide shade. Relative to piping water, however, canal covers would have a high maintenance cost and short lifespan.

Shading the canal may produce additional benefits as well as some drawbacks. An ancillary benefit of shading the canal would be a decrease in water lost through evaporation. Use of vegetation to shade the canal, however, may increase water loss through evapotranspiration and entail a maintenance cost associated with tree trimming and fallen branch removal. Root growth into canal banks may also compromise canal bank integrity and increase water loss through seepage.

**Piping**

The ultimate shading technique for aquatic plant control is to entirely cover the canal with light-blocking material or to pipe the water. Because of the radius of turns required, adequate right-of-way may not be available for pipe installation in large canals. In smaller canals, however, piping water may provide a long-term (25 years) solution to aquatic weed problems. Use of pipe for water delivery depends upon canal slope and canal size. Pipe diameters up to 36 inches may be economically installed in existing canal beds, and provide capacity for 15 to 20 cfs. Pipe installation has the added benefit of eliminating seepage and evaporation losses and provides the highest level of water conservation.

Stormwater flows may reduce the practicality of pipe for water delivery. Some canals in the RRVP are used for stormwater management during winter, and the pipe size necessary for irrigation water delivery may not be adequate for handling stormwater flows. Restricted stormwater flows may causes flooding upstream of piped canal sections. Where possible, stormwater flow should be directed to natural water courses and diverted from irrigation canals. Diversion of stormwater would facilitate use of pipe for water delivery and reduce sediment deposition in canals; thereby increasing water conservation, minimizing the availability of aquatic plant rooting substrate, and reducing the requirement for aquatic plant management efforts with the associated environmental risks.

**Fish, grass carp**

Several fish species have been considered as biological control agents for aquatic vegetation. Van Zon (1976) listed 29 species that are phytophagous, feeding primarily on phytoplankton or macrophytes. In practice, however, only one species, the grass carp (Ctenopharyngodon idella), has been used for large scale aquatic weed control (van der Zweerde 1993). The grass carp, which is a member of the Cyprinidae or minnow family, is a voracious feeder. Small fish may consume a daily ration of aquatic plants equal to several times their body weight per day (Opuszynski 1972, cited in California Dept. Fish and Game 1989). Larger fish may consume a ration equal to their body weight (Leslie et al. 1996, Stocker 1996).

The biology and physiology of grass carp contribute to their effectiveness for aquatic plant control. Grass carp have a short gut, for a herbivore, which allows them to process and eliminate consumed plants quickly (Leslie et al. 1996). Grass carp are essentially 100 percent herbivorous at lengths greater than 3 cm. Although animal prey is not sought by larger fish, animals will be consumed when they are presented in the absence of plants, and inadvertently when they are attached to consumed plants (van der Zweerde 1993).

Grass carp grow rapidly (up to 29 g/day) under uncrowded conditions with abundant food and optimal temperatures (Shelton et al. 1981, Sutton and van Diver 1986, cited in Leslie et al. 1996). In temperate regions, feeding begins at 3 to 9 C, with consumption and growth are typically greatest between 21 and 26 C. Regional acclimation may result in varying temperature optima (Leslie et al. 1996). Plant consumption is reduced at dissolved oxygen concentrations lower than 4 mg/L (Rottmann 1977).

Although rather indiscriminate in their feeding, and not a biocontrol agent in the classical sense (sensu Doutt 1967; Roush and Cate 1980; Pietersee 1993, DeLoach 1997), grass carp do exhibit preferences for certain aquatic plant species. Plant preference depends upon the age, size, physiological state of the fish, and on environmental conditions. Small grass carp select small or soft plants, such as duckweeds, filamentous algae, and softer pondweeds. Larger fish still prefer softer plants (although algae are less preferred) but will accept more fibrous plants (Opuszynski 1972, Rottaman 1977).

Site differences influence palatability of plants. Grass carp preference for a species may differ among plants collected from different sites. In one study (Bonar et al. 1990), consumption was positively correlated with plant calcium and lignin content, and negatively correlated with iron and cellulose. Plant nutrient content is, in turn, determined by site characteristics (Hutchinson 1975). These site difference are likely responsible for the sometimes contradictory results of feeding preference studies (Bowers et al. 1987, Chapman and Coffey 1971, Pine et al. 1989, Pauley et al. 1994).

Grass carp are endemic to the large rivers of Asia from the Amur River in Siberia south. All fish introduced into the U.S. are warm-water acclimated fish of Chinese origin (Pauley et al. 1994). Grass carp were first introduced into the U.S. in 1963 and the first documented stocking for weed control occurred in 1970 in Arkansas (Bailey and Boyd 1972, cited in Leslie et al. 1996). Since then, grass carp have been widely distributed in the U.S. for aquatic weed control .

Escape and establishment of reproductive populations of grass carp into river systems (Brown and Coon 1991, Webb et al. 1994, Raibley et al. 1995, Elder and Murphy 1997), and growing concern about the potential environmental impacts of the fish, stimulated some states to ban grass carp. Research on production of mono-sex fish and sterile hybrids provided unsatisfactory results (Leslie et al. 1996). In the 1980s, however, fish culturists were successful in inducing triploidy in grass carp using heat-shock (Thompson et al. 1987) or hydrostatic pressure-shock (Cassini and Caton 1986) of fertilized grass carp eggs. Triploid grass carp are functionally sterile (U.S. Fish and Wildlife Service 1988).

Diploid grass carp are illegal in West Coast states. Beginning in 1990, Washington permitted the introduction of triploid fish into lakes and ponds for aquatic weed control with requirements for containment (Pauley et al. 1994). A recent evaluation of the grass carp stocking program found that stocking in lakes typically resulted in aquatic plant eradication or no control; use of grass carp for maintenance of a desired amount of vegetation was rarely successful (Bonar et al. 1996). Current recommendations for grass carp use in Washington are more restrictive than in the past.

Grass carp were introduced into California to manage hydrilla in the Imperial Irrigation District (IID) in Southern California. Prior to grass carp introduction, costs for aquatic weed management in the IID were $250,000 to $400,000 per year. These costs did not include labor costs of individual farmers required to maintain pipe, pumps, etc. free of plant fragments. The pre-grass carp program was primarily mechanical, and included management of only the worst problems and provided only enough control to maintain flow in the system. The grass carp management program costs approximately $250,000 per year (1992 dollars) to provide plant-free water flow in 2,575 km of canal (approximately $97/km) (Stocker 1996).

## ENDANGERED SPECIES

Currently, EPA is developing a program ("The Endangered Species Protection Program") to identify all pesticides whose use may cause adverse impacts on endangered and threatened species and to implement mitigation measures that will eliminate the adverse impacts. The program would require use restrictions expressed on the FIFRA label to protect endangered and threatened species at the county level. In the future, EPA plans to publish a description of the Endangered Species Program in the Federal Register and have available voluntary county-specific bulletins.

## REGULATORY POLLUTION REDUCTION REQUIREMENTS

Federal and State regulations require that effluent limitations set forth in a NPDES permit must be either technology- or water quality-based. Technology-based limitations are set by regulation or developed on a case-by-case basis (40 CFR 125.3, and Chapter 173-220 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992). The more stringent of these two limits must be chosen for each of the parameters of concern.

## TECHNOLOGY BASED WATER QUALITY PROTECTION REQUIREMENTS

Sections 301, 302, 306, and 307 of the FWPCA established discharge standards, prohibitions, and limits based on pollution control technologies. These technology-based limits are "best practical control technology" (BPT), "best available technology economically achievable" (BAT), and "best conventional pollutant control technology economically achievable" (BCT). Compliance with BPT/BAT/BCT may be established using a "best professional judgement" (BPJ) determination.

The State has similar technology-based limits which are described as: "all known, available and reasonable methods of control, prevention, and treatment" (AKART) methods. AKART is referred to in State law under RCW 90.48.010, RCW 90.48.520, 90.52.040 and RCW 90.54.020. The Federal technology-based limits and AKART are similar but not equivalent. AKART: (1) may be established for an industrial category or on a case-by-case basis; (2) may be more stringent than Federal regulations; and (3) includes not only treatment, but also BMPs such as prevention and control methods (i.e. waste minimization, waste/source reduction, or reduction in total contaminant releases to the environment). The Department and the Federal Environmental Protection Agency (EPA) concur that, historically, most discharge permits have determined AKART as equivalent to BPJ determinations.

The pesticide application industry has been regulated by EPA under the terms of the Federal Insecticide, Fungicide, and Rodenticide Act, (FIFRA). Use of pesticides are regulated by label use requirements developed by EPA. In developing label use requirements, EPA requires the pesticide manufacturer to register each pesticide and provide evidence that the pesticide will work as promised and that unacceptable environmental harm will be minimized. The standards for environmental protection are different between the CWA and FIFRA.

It is the intent of this general permit to authorize aquatic weed control in a manner that also complies with federal and other state requirements.

All WWDPs issued by the department must incorporate requirements to implement reasonable prevention, treatment and control of pollutants. Since following FIFRA label requirements is currently a practice in place, it is reasonable to expect this practice to continue. An engineering report of aquatic weed control alternatives in irrigation systems is currently underway sponsored by the Washington State Water Resources Association. The information generated in the report should provide the department with additional information to refine the determination of what constitutes reasonable prevention, treatment, and control of aquatic herbicide wastes.

The legislature established in the Washington Pesticide Control Act that prevention of pollution in this case is reasonable in the context of an Integrated Pest Management Plan. IPMs require the investigation of all control options, but do not require nonchemical pest controls as the preferred option. The goal of IPMs is to establish the most effective means of control whether biological, chemical, nonchemical, or a combination. Most aquatic weed control strategies are such a combination. It is reasonable to require IPM under the provisions of AKART as best management practices in WAC 173-226-070(1). The engineering report required by the permit will establish guidelines for preparation of an IPM plan by each permittee.

Treatment of the pollutants addressed in this permit is difficult due to the diffuse nature and low concentrations that exist after the pesticides have become waste. The Talent decision established that aquatic pesticides become waste in the water after the pesticide has performed its intended action and the target organisms are controlled. Treatment of waters where pesticide residues threaten to cause unacceptable environmental harm may be needed in some situations, but not routinely. The engineering report to be prepared during the term of this permit will address this and other issues.

**WATER QUALITY BASED REQUIREMENTS**

The aquatic weed control activities affect surface waters of the State. These waters are protected by chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington. The purpose of these standards is to establish the highest quality of State waters, through the reduction or elimination of contaminant discharges to the waters of the State, consistent with: public health; public enjoyment; the propagation and protection of fish, shellfish, and wildlife; and existing and future beneficial uses. This purpose is reached, in part, by compliance with the limitations, terms and conditions of the General Permit.

The aquatic weed control activities which discharge, directly or indirectly, to natural surface waters shall be required to meet the State water quality standards for Class A and Class AA surface waters as given in chapter 173-201A WAC. The characteristic beneficial uses of Class AA and A surface waters include, but are not limited to, the following: domestic, industrial and agricultural water supply; stock watering; the spawning, rearing, migration and harvesting of fish; the spawning, rearing and harvesting of shellfish; wildlife habitat; recreation (primary contact, sport fishing, boating, aesthetic enjoyment of nature); commerce and navigation.

RCW 90.48.035 authorizes establishment of water quality standards for waters of the State. The State has implemented water quality standards in chapter 173-201A WAC. All waste discharge permits issued pursuant to NPDES or SWD regulations are conditioned in such a manner that all authorized discharges shall meet State water quality standards. Standards include an "antidegradation" policy which states that beneficial uses shall be protected.

Discharges from aquatic weed control activities may contain pollutants which, in excessive amounts, have a reasonable potential to cause, or contribute to, violations of State water quality due to the presence of materials toxic to aquatic species. The Department has deemed that, when properly applied and handled in accordance with the terms and conditions of the general permit, aquatic weed control activities will comply with State water quality standards, will maintain and protect the existing characteristic beneficial uses of the surface waters of the State, and will protect human health. New information regarding previously unknown environmental and human health risks may cause reopening of the general permit.

No mixing or dilution zone shall be authorized to the Permittee for any discharge to natural surface waters under this general permit. The short term water quality modification provisions of the permit will allow the discharges authorized by the general permit to cause a temporary diminishment of some beneficial uses while the water body is altered to restore flow capacity. The short term modification will be short in that the actual impairment will be short lived, while the overall availability of authorization extends through the term of the permit. The general permit conditions, the engineering report, and the integrated pest management plan to be developed prior to the third year of the general permit term satisfies the regulatory requirement for a long term plan that allows short term modifications to extend for five years.

The activities authorized by this general permit do not have a reasonable potential to cause a violation of state water quality standards (WAC 173-201A) within the irrigation system so long as the activities are allowed under the short term water quality modification. The water quality modification provides for an exception to meeting certain provisions of the state water quality standards such as meeting all beneficial uses all the time. Activities covered under this permit are allocated a temporary zone of impact on beneficial uses, but the impact must be transient, and must allow for full restoration of water quality and protection of beneficial uses upon project completion. The conditions of this permit constitute the requirements of a short term water quality modification.

This general permit provides the authority to discharge the listed aquatic herbicides and not any authority to discharge other pollutants which may be present in the irrigation system. Other regulatory tools will be used to address impacts not directly associated with discharge of herbicides.

The possible discharge of residual herbicides does create a reasonable potential to cause a violation of state water quality standards outside the irrigation system in the natural waters. Natural waters are those surface waters which are located where surface water courses existed prior to the alteration of water drainage and creation of reclamation projects. The short term water quality modification does not apply in natural waters due to the relative toxicity of discharged herbicides and the general ability to control treated water parcels within the irrigation system.

The reasonable potential to cause a violation of water quality standards requires that a limit be placed on the potential discharge to natural waters. Limits were derived for acrolein, xylene, and copper. The resultant limits to be met prior to mixing with natural waters are as follows.

| Parameter | Maximum daily concentration |
|---|---|
| Copper, dissolved | 25 ug/l |
| Acrolein | 21 ug/l |
| Xylene | 10 mg/l |
| The maximum daily limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. The maximum daily discharge is the average measurement of the pollutant over the day. | |

The proposed permit contains a schedule of compliance for meeting the water quality based limits. The permittees have until the 2005 irrigation season to refine water and herbicide use practices to avoid exceeding the limits in natural waters.

The acrolein limit is based on a level established to protect freshwater organisms from adverse toxic effects due to chronic exposure by the state of Oregon (OAR Chapter 340). Washington State has no established water quality criteria for acrolein but requires that concentrations of toxic substances without specific criteria that are protective of aquatic organisms be determined from available relevant information.

The copper limit is based on the water quality criteria established in Washington State regulation for the protection of aquatic organisms. Data from the monitoring during the 2001 irrigation season indicates that most hardness values in the irrigation systems range between 100 and 200 ppm. The copper criteria is dependent on the hardness of the water and 150 ppm is used as the average hardness to establish the permit limit.

The xylene limit is based on the FIFRA label, which does not allow concentrations in excess of 10 mg/liter (10 ppm) to be discharged to receiving waters.

Washington's water quality standards now include 91 numeric human health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the residual from the applicant's discharge does not contain concentrations of chemicals from the National Toxics Rule at a level of concern based on existing data or knowledge. The discharge will be re-evaluated for impacts to human health at the next permit reissuance.

**SEDIMENT QUALITY**

Generally, copper is adsorbed quickly to particles in the water column that settle out to the sediments. In lake systems, these rates of adsorption can be very high and persistent. However, this may not be the case for rapidly flowing systems such as irrigation canals. When Farmers Ditch Irrigation Canal was treated continuously at rates of 0.19, 0.05 or 0.5 mg/L, 60 percent of the applied copper remained adsorbed to the ditch bottom sediments. At the end of the treatment season, sediment concentrations of copper were generally below 50 mg/l.

During treatment of the Roza Main Canal with copper sulfate, copper did not significantly absorb to the bottom sediments. Even though sediment concentrations rose after a single slug treatment, they returned to background levels within about seven to eight days. This may be due to release of copper from sediments due to hydrolysis. Also, copper may also be removed from the area by scouring action of the flowing water (Nelson et al, 1969). However, daily treatments of the East 14.7 Lateral Canal for 4.5 months at a 1 lb Cu/ft3 resulted in an increase of sediment copper concentrations from 20 mg/L to approximately 120 mg/L.

There is no good evidence that the copper in the sediments redissolves or is simply transported downstream by the water currents. If it does redissolve then it may eventually be transported into natural receiving waters where it is available biologically to in-stream biota. If it stays adsorbed and is transported downstream, then high-copper sediments may be deposited into the natural water systems. If it is dredged out during the off-season, then it can be effectively removed from the system.

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400).

We do not have enough information to conclude whether or not there is reasonable potential to violate the Sediment Management Standards. When freshwater sediment criteria are established, the department will review the concentrations of copper in sediments due to copper treatments in irrigation supply systems.

## SEPA COMPLIANCE

This general permit will undergo SEPA. The conditions of this permit should satisfy any water quality related SEPA concerns.

## ELIGIBILITY AND GEOGRAPHIC AREA OF COVERAGE

For the purposes of the general permit, the aquatic weed control activities for which the general permit is valid include waters of the State within irrigation systems and at the point of discharge back to natural waters of the state. Irrigation water suppliers whose system is capable of discharging to or intersecting with natural waters whether unintentionally or by design are required to be covered under this permit or another NPDES permit.

The majority of irrigation water delivery systems occur in the Yakima, Wenatchee, Okanogan, Spokane, Touchet and Walla Walla River drainages and the three Columbia Basin Project irrigation districts make up the majority of the acres irrigated in the state. Attached are partial lists and maps of Washington State irrigation districts.

## INTEGRATED PEST MANAGEMENT AND BEST MANAGEMENT PRACTICES

The industry should continue to examine the possibility of alternatives to reduce the need for aquatic pesticides. The following practices have been used in similar activities:

1) All errors in application and spills are reported to the proper authority.
2) Informing the public of planned spray activities.
3) Applying a decision matrix concept to the choice of the most appropriate formulation.
4) Staff training in the proper application of pesticides and handling of spills.
5) The applicators must follow the pesticide label requirements and be knowledgeable about human health risks and mitigation processes as outlined in the MSDS.
6) The irrigation district must develop and follow an IPM plan accepted by Ecology.
7) The irrigation districts will be required to monitor treated waters during the season. Monitoring can result in a better management of pesticide applications, avoidance of excessive applications, and also reduced amounts of the pesticides.

An important goal of the first permit cycle is to reinforce the concept of reduction in pesticide residuals. A reduction in the discharge of pollutants to waters of the State can be achieved by using proper BMPs, which include integrated pest management. The engineering report will provide additional information to assist each district in developing an IPM plan.

**MONITORING**

Monitoring of residual pesticides may be required to confirm assumptions of persistence when applications are performed in compliance with the FIFRA label.and state requirements. A permittee may propose and gain approval for a monitoring plan, either independently or as part of a group, in lieu of monitoring each application. The intent is to gather information to confirm the assumptions of persistence and toxicity relative to the rate of application. This information may better define the period of temporary diminishment of beneficial uses.

**REPORTING AND RECORDKEEPING**

The conditions of S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-226-090).

**LAB ACCREDITATION**

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, Accreditation of Environmental Laboratories.

**SMALL BUSINESS ECONOMIC IMPACT ANALYSIS**

The general permit requires compliance with federal and state laws and regulations and places no disproportionate burden on small business. The monitoring is flexible and meeting pesticide label requirements is already required under FIFRA. Complying with water quality standards is required by state and federal law.

**PERMIT MODIFICATIONS**

The Department may modify this permit to impose new or modified numerical limitations, if necessary to meet Water Quality Standards for Surface Waters, Sediment Quality Standards, or Water Quality Standards for Ground Waters, based on new information obtained from sources such as inspections, effluent monitoring, or Department approved engineering reports. The Department may also modify this permit as a result of new or amended state or federal regulations.

**WHEN COVERAGE IS EFFECTIVE**

Unless the Department either desires to respond in writing to any facility's Application for Coverage or obtains relevant written public comment, coverage under this general permit of such a facility will commence on the later of the following:

- The thirty-first ($31^{st}$) day following receipt by the Department of a completed and approved Application for Coverage;
- The thirty-first ($31^{st}$) day following the end of a thirty (30) day public comment period; or
- The effective date of the general permit.

If the Department desires to respond in writing to any facility's Application for Coverage or obtains relevant written public comment, coverage under this general permit of such a facility will not commence until the Department is satisfied with the results obtained from written correspondence with the individual facility and/or the public commentor.

**RESPONSIBILITY TO COMPLY WITH OTHER REQUIREMENTS**

The Department has established, and will enforce, limits and conditions expressed in the general permit for the discharge of wastestreams containing various pesticides registered for use by the EPA and the Washington State Department of Agriculture. These agencies will enforce the use, storage and disposal requirements expressed on pesticide labels. The Permittee must comply with both the pesticide label requirements and the general permit conditions. The general permit does not supersede or preempt Federal or State label requirements or any other applicable laws and regulations. General permit Condition G15 reminds the Permittee of this fact.

**GENERAL CONDITIONS**

General Conditions are based directly on State and Federal law and regulations and are included in all aquatic pesticide general permits..

**RECOMMENDATION FOR PERMIT ISSUANCE**

The general permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, protect human health, aquatic life, and the beneficial uses of waters of the State of Washington. The Department proposes that the general permit be issued for five (5) years.

## APPENDIX A – PUBLIC OPPORTUNITY TO COMMENT

PUBLIC COMMENT AND INFORMATION

A Public Notice of Draft (PNOD) was published in the State Register on February 6, 2002. A public hearing on the draft General Permit will be held on March 12 in the city of Ellensburg at Hal Holmes center. A one hour workshop to explain proposed changes and answer questions will be held immediately preceding the hearings.

Interested persons are invited to submit comments regarding the proposed issuance of the General Permit. Comments on the general permit may be delivered at the public hearings as either written or oral testimony. Written comments may also be submitted to the Ecology Office at the address below:

Washington State Department of Ecology
Water Quality Program
Attention: Kathleen Emmett, General Permits Manager
PO Box 7600
Olympia, WA 98504-7600

All comments must be submitted by 5 p.m. on March 12, 2002 to be considered in the final permit determination. A responsiveness summary will be prepared and available for public review. It will be sent to all parties who submitted comments by the deadline.

The proposed and final general permit, fact sheet, application form, and other related documents are on file and may be inspected and copied between the hours of 8:00 a.m. and 4:30 p.m., weekdays at the following Department locations:

Washington State Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902
(509) 454-7298
TDD (509) 454-7673
FAX (509) 575-2809
Contact: Ray Latham

Washington State Department of Ecology
Eastern Regional Office
North 4601 Monroe, Suite 202
Spokane, WA 99205
(509) 456-2874
TDD (509) 458-2055
FAX (509) 456-6175
Contact: Nancy Weller

Washington State Department of Ecology
Northwest Regional Office
3190 - 160th Ave. SE
Bellevue, WA 98008-5452
(425) 649-7133
TDD (435) 649-4259
FAX (425)649-7098
Contact: Tricia Shoblom

Washington State Department of Ecology
Southwest Regional Office
PO Box 47775
Olympia, WA 98504-7775
(360) 407-6300
TDD (360) 407-6306
FAX (360) 407-6305
Contact: Janet Boyd

## APPENDIX C -- GLOSSARY

DEFINITIONS

"Administrator" means the administrator of the EPA.

"Antidegradation Policy" is as stated in WAC 173-201A-070.

"Authorized representative" means:

1. If the entity is a corporation, the president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operation facilities, if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

2. If the entity is a partnership or sole proprietorship, a general partner or proprietor, respectively; and

3. If the entity is a federal, state or local governmental facility, a director or the highest official appointed or designated to oversee the operation and performance of the activities of the government facility, or his/her designee.

The individuals described in paragraphs 1 through 3, above, may designate another authorized representative if the authorization is in writing, the authorization specifies the individual or position responsible, and the written authorization is submitted to the Department.

"Best management practices (BMPs)" means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State and their sediments. BMPs also include, but are not limited to, treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

"Certified applicator" means any individual who is licensed as a commercial pesticide applicator, commercial pesticide operator, public operator, private-commercial applicator, demonstration and research applicator, or certified private applicator, or any other individual who is certified by the director to use or supervise the use of any pesticide which is classified by the EPA or the director as a restricted use pesticide.

"Code of Federal Regulations (CFR)" means a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. Environmental regulations are in Title 40.

"Composite sample" means the combined mixture of not less than four (4) "discrete samples" taken at selected intervals based on an increment of either flow or time. Volatile pollutant discrete samples must be combined in the laboratory immediately prior to analysis. Each discrete sample shall be of not less than 200 ml and shall be collected and stored in accordance with procedures prescribed in the most recent edition of Standard Methods for Examination of Water and Wastewater[27].

"Conveyance" means a mechanism for transporting water or wastewater from one location to another location including, but not limited to, pipes, ditches, and channels.

"Daily maximum" means the greatest allowable value for any calendar day.

"Daily minimum" means the smallest allowable value for any calendar day.

"Dangerous waste" means the full universe of wastes regulated by Chapter 173-303 WAC, including hazardous waste.

"Degrees C" means temperature measured in degrees Celsius.

"Degrees F" means temperature measured in degrees Fahrenheit.

"Department" means the Washington State Department of Ecology.

"Detention" means the collection of water into a temporary storage device with the subsequent release of water either at a rate slower than the collection rate, or after a specified time period has passed since the time of collection.

"Director" means the director of the Washington State Department of Ecology or his/her authorized representative.

"Discharger" means an owner or operator of any "facility", "operation", or activity subject to regulation under Chapter 90.48 RCW.

"Discrete sample" means an individual sample which is collected from a wastestream on a one-time basis without consideration to flow or time, except that aliquot collection time should not exceed fifteen (15) minutes in duration.

"Effluent limitation" means any restriction established by the local government, the Department, and EPA on quantities, rates, and concentrations of chemical, physical, biological, and/or other effluent constituents which are discharged from point sources to any site including, but not limited to, waters of the state.

"Environmental Protection Agency (EPA)" means the U.S. Environmental Protection Agency or, where appropriate, the term may also be used as a designation for a duly authorized official of said agency.

"Erosion" means the wearing away of the land surface by movements of water, wind, ice, or other agents including, but not limited to, such geological processes as gravitational creep.

"Existing operation" means an operation which commenced activities resulting in a discharge, or potential discharge, to waters of the state prior to the effective date of the general permit for which a request for coverage is made.

"Facility" means the actual individual premises owned or operated by a "discharger" where process or industrial wastewater is discharged.

"FWPCA" means the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), as now or as it may be amended.

"General permit" means a permit which covers multiple dischargers of a point source category within a designated geographical area, in lieu of individual permits being issued to each discharger.

"Gpd" means gallons per day.

"Grab sample" is synonymous with "discrete sample".

"Ground water" means any natural occurring water in a saturated zone or stratum beneath the surface or land or a surface water body.

Hazardous waste" means those wastes designated by 40 CFR Part 261, and regulated by the EPA.

"Individual permit" means a discharge permit for a single point source or a single facility.

"Industrial wastewater" means water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feedlots, poultry house, or dairies. The term includes contaminated storm water and also, leachate from solid waste facilities.

“Irrigation System” means a controlled system consisting primarily of manmade canals, ditches, and ponds designed and operated for the delivery or management of water for irrigation purposes.

"Mg/L" means milligrams per liter and is equivalent to parts per million (ppm).

"Monthly average" means that value determined by the summation of the instantaneous measurements during any single month divided by the number of instantaneous measurements collected during that same single month.

"Municipal sewerage system" means a publicly owned domestic wastewater facility or a privately owned domestic wastewater facility that is under contract to a municipality.

“Natural waters” For this general permit only, are' located where surface water courses existed prior to the alteration of water drainage and creation of reclamation and irrigation projects.

"New operation" means an operation which commenced activities which result in a discharge, or a potential discharge, to waters of the state on or after the effective date of an applicable general permit.

"NPDES" means the National Pollutant Discharge Elimination System under section 402 of FWPCA.

"Operation" is synonymous with "facility".

"Party" means an individual, firm, corporation, association, partnership, copartnership, consortium, company, joint venture, commercial entity, industry, private corporation, port district, special purpose district, irrigation district, trust, estate, unit of local government, state government agency, federal government agency, Indian tribe, or any other legal entity whatsoever, or their legal representatives, agents, or assignee.

"Permit" means an authorization, license, or equivalent control document issued by the Department to implement Chapter 173-200 WAC, Chapter 173-216 WAC and/or Chapter 173-226 WAC.

"Person" is synonymous with "party".

"pH" means the logarithm of the reciprocal of the mass of hydrogen ions in grams per liter of solution. Neutral water, for example, has a pH value of 7 and a hydrogen-ion concentration of $10^{-7}$. pH is a measure of a substance's corrosivity (acidity or alkalinity).

"Point source" means any discernible, confined and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

"Pollutant" means any substance discharged, if discharged directly, would alter the chemical, physical, thermal, biological, or radiological integrity of the waters of the state, or would be likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare, or to any legitimate beneficial use, or to any animal life, either terrestrial or aquatic. Pollutants include, but are not limited to, the following: dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, pH, temperature, TSS, turbidity, color, $BOD_5$, TDS, toxicity, odor and industrial, municipal, and agricultural waste.

"Priority pollutant" means those substances listed in the federal 40 CFR Part 423, Appendix A, or as may be amended.

"Process wastewater" means water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product.

"Publicly owned treatment works (POTW)" is synonymous with "municipal sewerage system".

"Reasonable times" means at any time during normal business hours; hours during which production, treatment, or discharge occurs; or times when the Department suspects occurrence of a violation.

"Regional administrator" means the regional administrator of Region X of the EPA or his/her authorized representative.

"Retention" means the collection of water into a permanent storage device, with no subsequent release of water.

"Severe property damage" means substantial physical damage to property, damage to the pretreatment facilities or treatment/disposal facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays or losses in production.

"Shall" is mandatory.

"Significant" is synonymous with "substantial".

"Significant process change" means any change in a facility's processing nature which will result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or violate the terms and conditions of this general permit, including but not limited to, facility expansions, production increases, or process modifications.

"Site" means the land or water area where any "facility", "operation", or "activity" is physically located or conducted, including any adjacent land used in connection with such facility, operation, or activity. "Site" also means the land or water area receiving any effluent discharged from any facility, operation, or activity.

"Small business" has the meaning given in RCW 43.31.025(4).

"Standard Industrial Classification (SIC) Code" means a classification pursuant to the Standard Industrial Classification Manual issued by the U.S. Office of Management and Budget.

"State" means the State of Washington.

"Substantial" means any difference in any parameter including, but not limited to, the following: monitoring result, process characteristic, permit term or condition; which the Department considers to be of significant importance, value, degree, amount, or extent.

"Surface waters of the state" means all waters defined as "waters of the United States" in 40 CFR 122.2 within the geographic boundaries of the state of Washington. This includes lakes, rivers, ponds, streams, inland waters, salt waters and all other surface waters and watercourses within the jurisdiction of the state of Washington.

"Total suspended solids (TSS)" means total suspended matter that either floats on the surface of, or is in suspension in water or wastewater, expressed in mg/L.

"Toxic amounts" means any amount, i.e., concentration or volume, of a pollutant which causes, or could potentially cause, the death of, or injury to, fish, animals, vegetation or other desirable resources of the state, or otherwise causes, or could potentially cause, a reduction in the quality of the state's waters below the standards set by the Department or, if no standards have been set, causes significant degradation of water quality, thereby damaging the same.

"Toxics" means those substances listed in the federal priority pollutant list and any other pollutant or combination of pollutants listed as toxic in regulations promulgated by the EPA under section 307 of the FWPCA (33 U.S.C. 1317 et seq.), or the Department under Chapter 173-200 WAC, Chapter 173-201A WAC, or Chapter 173-204 WAC.

"Unirrigated" means any lands having not been irrigated within 10 days prior to, or within 60 days after the application of any wastestream.

"Upset" means an exceptional incident in which a discharger unintentionally and temporarily is in a state of noncompliance with permit effluent limitations due to factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation thereof.

"Wastewater" means liquid-carried human wastes or a combination of liquid-carried waste from residences, business buildings, or industrial establishments.

"Waters of the state" means all waters defined as "surface waters of the state" and all waters defined as "waters of the state" in RCW 90.40.020.

"Water quality" means the chemical, physical, biological characteristics of water, usually in respect to its suitability for a particular purpose.

“Water Quality Preservation Area (WQPA)” means waters which have been designated as high quality waters based upon one or more of the following criteria:

1. Waters in designated federal and state parks, monuments, preserves, wildlife refuges, wilderness areas, marine sanctuaries, estuarine research reserves, and wild and scenic rivers;
2. Aquatic habitat having exceptional importance to one or more life stage of a candidate of listed priority species, established by the state Department of Fish & Wildlife, or a federally proposed or listed threatened or endangered species;
3. Rare aquatic habitat, ecological reference sites, or other waters having unique and exceptional ecological or recreational significance.

"Water quality standards" means the state of Washington's water quality standards for ground waters of the state (Chapter 173-200 WAC) and the state of Washington's water quality standards for surface waters of the state (Chapter 173-201A WAC).

In the absence of other definitions as set forth herein, the definitions as set forth in 40 CFR Part 403.3 shall be used for circumstances concerning the discharge of wastes.